AN ATLAS OF THE EMPIRE.

The British Empire (and Japan). Its Features, Resources, Commerce, Industries, and Scenery together with the Physical and Economic Conditions of the World. By W. Bisiker. 213 maps and 272 illustrations. (London: The Geographical Publishing Company, 1909.) Price 1*l.* 1*s.* net.

THE author offers this volume "as a contribution to 'Education and the Empire,'" and since his contribution has taken the shape of an atlas, presumably he had in view geographical education. Now while the British Empire, as such, might well enter into college or university curriculum as an historical subject, it cannot be treated in a geographical course. The Empire is not a geographical unity; from a geographer's point of view it is a heterogeneous collection of the whole or parts of widely different natural regions. We must treat of fragments, large or small, of tropical West Africa, of an isolated scrap of South America, and a similar arbitrary selection from other continents. The majority of the colonies and dependencies of the Empire cannot be geographically treated apart from the regions to which they belong. To attempt to carry the criterion of political ownership into geography is, to say the least, unscientific. The author admits the necessity of considering the economic productions of the entire world as a basis for the study of British trade. In that he is right, but surely the only true understanding of the Empire and the right conception of its place in the world must be reached through a study of the geography of the entire globe.

However, if this atlas falls short of educational requirements it will certainly prove of great service as a work of reference, especially for commercial purposes. Each of the large regions within the British Empire has two maps devoted to it, a photo-relief map and an ordinary political one. The former are finely executed and very instructive, but we doubt if they have as great a value as good contour maps. However, the physical names which they bear have been wisely chosen, and—a feature of geographical value—the railways are shown in relation to the surface relief. Submarine relief is well portrayed in these maps. In addition there are pressure, temperature, and rainfall maps, and various small economic charts for each region, all crowded with information graphically or statistically displayed. Each colony is illustrated by several small views, but these have often more artistic than scientific value. A number of general physical and economic charts of the world, most of which are too crowded and small to be instructive, complete the atlas, except for two pages devoted to Japan. We do not understand why that country alone of extra-British lands should have been included. The author would surely have been better advised to include the United States of America as a country the commercial interests of which lie nearest to those of Britain.

The statistical information, if rather condensed and summary, seems to be thoroughly up-to-date, and, so far as we have tested it, accurate. But a little expansion in this direction might not have been out of place. The bare statement, for instance, regarding Ireland's total trade, that it was in 1907 17,767,657*l.*, might be misleading without a qualifying note that this refers only to trade with lands beyond the British Isles. In reality Ireland's total trade was (1906) more than six times that figure. The index to commercial products is too meagre to be of much use, and should have been considerably expanded.

One or two minor errors should be pointed out. The South Orkney and South Shetland Islands, despite recent assertions to the contrary, are not British, but Argentine possessions. South Georgia is used as a whaling station, and exploited for its sea-elephants and penguins rather than "as a field for mining" (p. 56), though gold and coal have been reported. King penguins do not breed on the Antarctic continent (p. 55). On plate 44, Fig. 18, the house shown is not, as stated, Napoleon's dwelling at St. Helena, but quite another building. The statement that the Nile floods are caused chiefly by the Blue Nile (p. 53) does not convey the whole truth, for the Sobat and the Atbara largely contribute. Nor is it quite accurate to assert that pearls are formed "round grains of sand or other hard substances," since they are generally formed round encysted larvæ of parasitic worms; and we are at a loss to understand who the Buddhists are who figure so largely in the south-western United States on plate 15. However, these are small points, and care and thought have evidently been expended on the work. But a less restricted outlook would undoubtedly have enhanced the value of this atlas. A cheaper edition at 16*s.* seems only to differ in the binding.

INDUSTRIAL ELECTRICITY.

Électricité Industrielle. By C. Lebois. Deuxième Partie, Deuxième Edition. Pp. 437. (Paris: Ch. Delagrave, n.d.) Price 4 francs.

THE author is Inspector-General of Technical Instruction in France, and on the title-page we read that his work has been honoured by a subscription by the Ministers of Commerce and Technical Instruction. In these circumstances the reader may expect a book of exceptional merit, but in this expectation he will be disappointed. The book is no better and no worse than scores of others with which the market nowadays is flooded. The subtitle is "Second Part; Complementary Study of Continuous and Alternating Currents and Their Applications."

This subtitle describes sufficiently the contents. We find the usual explanation of the generation of an E.M.F. in the wires of an armature moving in the interpolar space, various armature windings, some examples of brush gear, different forms of magnet frame, the calculation of the magnetisation curve, formulæ for the E.M.F. and torque of a machine, the latter called a new formula, although it is certainly not new to English readers, some hints and examples on the design of continuous-current machines, and then a similar treatment of alternating-current machinery, including synchronous and non-synchronous motors, for which the author has coined the name "alternomoteurs."

Further, there are chapters on transformers, measuring instruments, meters, and other accessories. The

industrial application of the science is represented by examples of machinery made by French firms, some descriptions of transmission plant and wireless telegraphy. This short account of the contents will show that the book covers, within its compass of some 430 small octavo pages, a wide field, and that for this reason alone anything like exhaustive treatment cannot be expected. Its usefulness is also marred by the defect very frequently found in Continental books of having no index.

In one respect the book is, however, an improvement on other French works on the same subject, and that is the use of mechanical illustrations of electrical phenomena. French men of science have always been adverse to graphic treatment or mechanical analogies. They are content to represent the subject in a purely analytical manner, and although it must be confessed that in elegance of mathematical treatment the French school is supreme, this kind of treatment does not lead so easily to an understanding of the subject as the use of graphic methods and mechanical analogies, which is a characteristic of the English school. Even so highly-trained a mathematician as Maxwell did not disdain the use of some very simple mechanical contrivance in order to make clear an intricate electrical phenomenon, and since Maxwell's time all English writers and most German have followed this lead.

Now we find that the author of the book under review has also gone over to the school of Faraday and Maxwell, and uses mechanical analogies to express electrical processes. As a good example of his methods may be taken the vectorial addition of currents illustrated by the apparatus of Prof. Gaillard, which was primarily designed to illustrate an alternating current of so slow a periodicity that it can be shown by the harmonic movement of a spot of light to a whole class of students (p. 185). Another model to represent three-phase currents and their properties is shown on p. 311. The mechanical representation of the principle of the inductor alternator, although, strictly speaking, not a model, but merely an incomplete machine, should prove useful to beginners.

The book is, in fact, written for beginners, if we may judge by the omission of many matters of more intricate nature. Thus, after explaining the process of commutation in a general way, the author dismisses the subject of sparking in a few lines by saying that in modern machines there is hardly any necessity to shift the brushes when the load changes. Nothing is said about commutation by brush resistance or interpoles, or Deri winding, or Parsons' compensating coils. Again, the short paragraph on inductive drop in a transformer is quite inadequate; we are told that the drop is from 1 to 1½ per cent. in each coil, but not a word is said about the influence of the details of the design on the drop. In the matter of cooling a transformer the author is equally superficial; he merely says that 20 sq. cm. cooling surface per watt lost will produce an admissible temperature rise. Such general statements are perfectly valueless, and, in fact, worse than that, for they are untrue.

The author seems to have a great aversion to the use of mathematical formulæ even when they are very simple and convenient. He seems to start from the supposition that his reader is so much of a beginner that he cannot even grasp the meaning of a very simple analytical expression, and to overcome this imaginary difficulty he uses numerical examples by preference. Most readers will consider this point of view to be wrong in principle. A man who is quite ignorant of even the simplest mathematics had better not attempt to study electrical matters, and if he has the modicum of mathematical knowledge required for the study of such elementary books as that under review, his task is not made easier, but more tedious, if matters that could be presented in three lines of mathematics are worked out in two pages of numerical examples. A striking instance of the cumbersomeness of this method is the deduction of the virtual value of an alternating current given on pp. 174 to 178. Here more than four pages of algebra and arithmetic are used to prove that the virtual current is equal to the crest value divided by the square root of 2. All this could have been shown by a few lines of very simple calculus, or, better still, by Blakesley's graphic method. GISBERT KAPP.

A GERMAN TEXT-BOOK OF ZOOLOGY.

Lehrbuch der Zoologie für Studierende. By Dr. J. E. V. Boas. Fünfte vermehrte und verbesserte Auflage. Pp. x+668; 603 figs. (Jena: Gustav Fischer, 1908.) Price 12 marks.

THE fact that Prof. Boas's well-known text-book has now reached its fifth edition speaks volumes for the importance attached to the study of zoology in Germany. The book, although it contains 668 large and closely-printed pages, is an elementary one, and is designed especially, as we are told in the preface, for students of medicine, veterinary science, and forestry.

German ideas as to the preliminary education of medical students must be very different from those which are held by the medical profession in this country. Perhaps the German students work harder, or it may be that they cover a wider field in a more superficial manner. Dr. Boas's text-book makes us suspect that it is a little of both, and although we think that the subject might well receive more attention from English medical students than it now does, yet we should hardly care to place the present volume in their hands. Excellent and interesting as it is in many respects, it appears to us to suffer greatly from over-condensation, from the attempt to cover far too much ground. We miss the detailed anatomical description of types to which English students have become accustomed, and although this can easily be, and we fear frequently is, overdone, it can hardly be altogether dispensed with in an elementary text-book. It is true we find a short description of the Amœba by way of general introduction to the study of structure and function, but this is the only special type which is at all adequately dealt with. Probably it is intended that the detailed study of types should be undertaken in the laboratory with the aid of a special practical text-book, but we have not noticed any reference by the author to the importance of such practical work.

The book illustrates very clearly the great difficulties which attend the teaching of zoology at the present